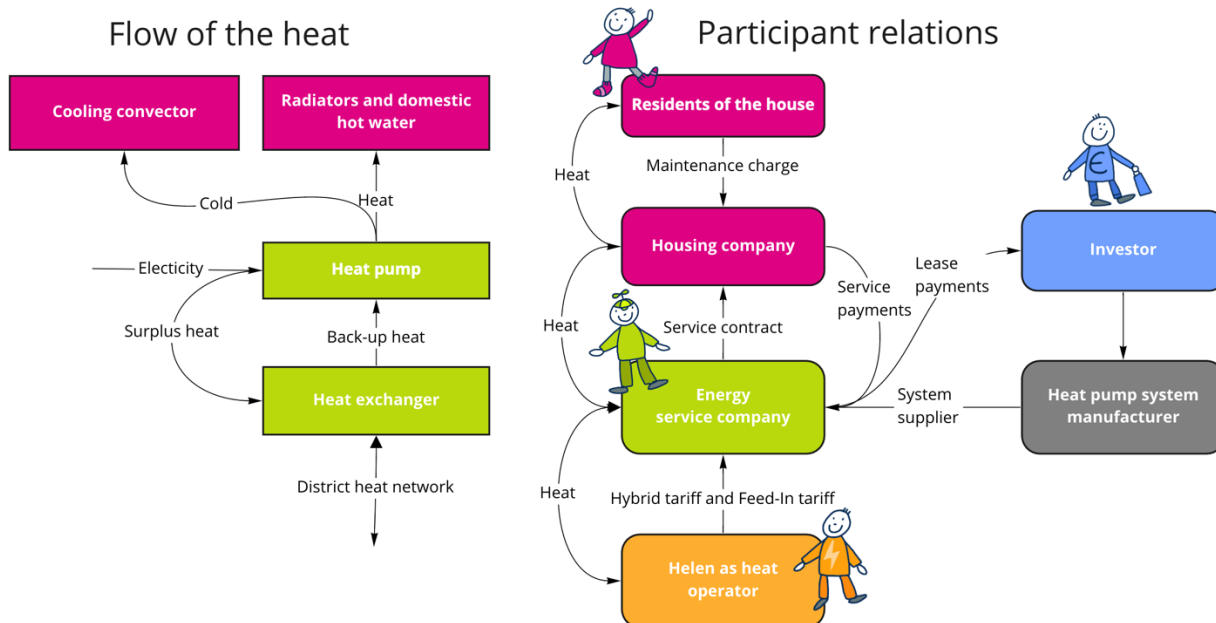


Appendix

In this appendix we provide additional information about the relations between each participant of the market. The first diagram presents the flow of heat and participant relations as an overall picture, and after it there is set of three business model canvases to show value propositions and other aspects of the business models in more detail.

In all business models we have focused on a situation where the housing company acts as a heat supplier for Helen with the help of the energy service company.



The Business Model Canvas

Designed for: Housing company

Designed by:

Date:

Version:

Key Partners <small>Who are our key partners? Who are our key suppliers? Which key resources are we acquiring from partners? Which key activities do partners perform?</small> INTENTIONS FOR PARTNERSHIPS Acquisition of scale and uncertainty Acquisition of particular resources and activities • Energy service company installs and operates heating system. • Extra heat is sold through feed-in tariff • City of Helsinki provides real time temperature monitoring system to each apartment. • District heat as back-up (hybrid tariff).	Key Activities <small>What key activities do our Value Propositions require? Our Distribution Channels? Customer Relationships?</small> INTENTIONS Problem Solving Problem Solving Problem Solving • Energy service agreement between housing company and energy service company Key Resources <small>What key resources do our Value Propositions require? Our Distribution Channels? Customer Relationships?</small> INTENTIONS FOR RESOURCES Problem Solving Problem Solving Problem Solving • Land or location for heat pump. • City donates temperature measurements	Value Propositions <small>What value do we deliver to the customer? Which one of our customer's problems are we helping to solve? What bundles of products and services are we offering to each customer segment? Which customer needs are we satisfying?</small> CHARACTERISTICS Access Performance Customization "Getting the job done" Design Reliability Price Risk reduction Cost reduction Availability Convenience • Risk free comfort with as low cost as possible • No work or decisions needed. • Same or better living conditions. • (Cooling as add-on service)	Customer Relationships <small>What type of relationship does each of our Customer Segments expect us to establish and maintain with them? Which ones have we established? How are they integrated with the rest of our business model? How costly are they?</small> INTENTIONS Personal assistance Standardized personal assistance Self-service Community Services Co-creation • Housing company outsources maintenance of good heating comfort to energy service company Channels <small>Through which Channels do our Customer Segments want to be reached? How are we reaching them now? How are our Channels integrated? Which ones work best? Which ones are most cost efficient? How are we integrating them with customer routines?</small> CHARACTERISTICS 1. Awareness How do we raise awareness about our company's products and services? 2. Evaluation How do we help customers evaluate our organization's Value Proposition? 3. Purchase How do we allow customers to purchase specific products and services? 4. Delivery How do we deliver a Value Proposition to customers? 5. After sales How do we provide post-purchase customer support? • Annual general meeting	Customer Segments <small>For whom are we creating value? Who are our most important customers?</small> • Residents of the house 
Cost Structure <small>What are the most important costs inherent in our business model? Which key resources are most expensive? Which key activities are most expensive?</small> IN-HOUSE BUSINESS MODEL Cost (development and structure, low price value proposition, maximum automation, extensive outsourcing) Value (time and cost reduction, maximum automation, premium value proposition) EXTERNAL BUSINESS MODEL External resources, costs, utilized External costs Economies of scale Economies of scope • Service fee for heating service supplier. • Fee reductions based on sold heat		Revenue Streams <small>For what value are our customers really willing to pay? For what do they currently pay? How are they currently paying? How would they prefer to pay? How much does each Revenue Stream contribute to overall revenues?</small> CHARACTERISTICS Access Price Risk Customization "Getting the job done" Design Reliability Price Risk reduction Cost reduction Availability Convenience • Residents pay maintenance charge		

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 **Strategyzer**
strategyzer.com

The Business Model Canvas

Designed for: Helen

Designed by:

Date:

Version:

Key Partners <small>Who are our key partners? Who are our key suppliers? Which key resources are we acquiring from partners? Which key activities do partners perform?</small> INTENTIONS FOR PARTNERSHIPS Acquisition of scale and uncertainty Acquisition of particular resources and activities • Maintenance companies of district heating network • Heat producers • Fuel suppliers	Key Activities <small>What key activities do our Value Propositions require? Our Distribution Channels? Customer Relationships?</small> INTENTIONS Problem Solving Problem Solving Problem Solving • Continuous network optimization based on data from network, buildings and production. Key Resources <small>What key resources do our Value Propositions require? Our Distribution Channels? Customer Relationships?</small> INTENTIONS FOR RESOURCES Problem Solving Problem Solving Problem Solving • District heating network for heat transfer between consumption and production • Transparent and fair tariff system: hybrid tariff, feed-in tariff.	Value Propositions <small>What value do we deliver to the customer? Which one of our customer's problems are we helping to solve? What bundles of products and services are we offering to each customer segment? Which customer needs are we satisfying?</small> CHARACTERISTICS Access Performance Customization "Getting the job done" Design Reliability Price Risk reduction Cost reduction Availability Convenience • Reliable heat delivery between all heat users and producers • Low distribution cost for all participants • Renewable heat • Compensation for excess heat from customers • Gradually lower emissions of heating	Customer Relationships <small>What type of relationship does each of our Customer Segments expect us to establish and maintain with them? Which ones have we established? How are they integrated with the rest of our business model? How costly are they?</small> INTENTIONS Personal assistance Standardized personal assistance Self-service Community Services Co-creation • Distribution agreements with customers • Heat sale and purchase agreements. Channels <small>Through which Channels do our Customer Segments want to be reached? How are we reaching them now? How are our Channels integrated? Which ones work best? Which ones are most cost efficient? How are we integrating them with customer routines?</small> CHARACTERISTICS 1. Awareness How do we raise awareness about our company's products and services? 2. Evaluation How do we help customers evaluate our organization's Value Proposition? 3. Purchase How do we allow customers to purchase specific products and services? 4. Delivery How do we deliver a Value Proposition to customers? 5. After sales How do we provide post-purchase customer support? • Energy reporting • API for hourly price of heat	Customer Segments <small>For whom are we creating value? Who are our most important customers?</small> • Apartment buildings • Office and commercial buildings • Public buildings • Smaller and bigger heat producers
Cost Structure <small>What are the most important costs inherent in our business model? Which key resources are most expensive? Which key activities are most expensive?</small> IN-HOUSE BUSINESS MODEL Cost (development and structure, low price value proposition, maximum automation, extensive outsourcing) Value (time and cost reduction, maximum automation, premium value proposition) EXTERNAL BUSINESS MODEL External resources, costs, utilized External costs Economies of scale Economies of scope • Heating network maintenance and operation • Heating fuels, emission allowances and other heat production costs • Payments for procured heat from other heat producers		Revenue Streams <small>For what value are our customers really willing to pay? For what do they currently pay? How are they currently paying? How would they prefer to pay? How much does each Revenue Stream contribute to overall revenues?</small> CHARACTERISTICS Access Price Risk Customization "Getting the job done" Design Reliability Price Risk reduction Cost reduction Availability Convenience • District heat payments from heat users		

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 **Strategyzer**
strategyzer.com


The Business Model Canvas

Designed for:
Energy service company

Designed by:

Date:

Version:

Key Partners <small>Who are our Key Partners? Who are our key suppliers? Which Key Resources are we acquiring from partners? Which Key Activities do partners perform?</small> KEY PARTNERS: key relationships <small>Cooperation and synergy Reduction of risk and uncertainty Allocation of personnel resources and activities</small> <ul style="list-style-type: none"> Heat pump manufacturer Smart heat control system provider Installation partner Service partner Investment fund or bank 	Key Activities <small>What Key Activities do our Value Propositions require? Our Distribution Channels? Customer Relationships? Revenue streams?</small> KEY ACTIVITIES <small>Production Problem Solving Relationship Management</small> <ul style="list-style-type: none"> Heat sale to Housing company Heat sale to Helen (feed-in tariff) District heat purchase from Helen (hybrid tariff) Building level energy optimization 	Value Propositions <small>What value do we deliver to the customer? Which one of our customer's problems are we trying to solve? What bundles of products and services are we offering to each Customer Segment? Which customer needs are we satisfying?</small>  VALUE PROPOSITIONS <small>Benefit Pain Convenience Customization "Doing the job better" Design Flexibility Performance Price Cost Reduction Risk Reduction Accessibility Completeness/Usability</small> <ul style="list-style-type: none"> Risk free comfort with as low cost as possible No work or decisions needed. Same or better living conditions. (Cooling as add-on service) Heat to reach 300 MW target 	Customer Relationships <small>What type of relationship does each of our Customer Segments expect us to establish and maintain with them? Which ones have we established?</small> <ul style="list-style-type: none"> Energy sale agreement with Housing company Heat sale agreement with Helen (feed-in) Heat purchase agreement with Helen (hybrid tariff) 	Customer Segments <small>For whom are we creating value? Who are our most important customers?</small> KEY CUSTOMER SEGMENTS <small>Mass Market Niche Market Segmented Diversified Multi-sided Platform</small> <ul style="list-style-type: none"> Housing companies Helen as heat buyer
Cost Structure <small>What are the most important costs inherent in our business model? Which Key Resources are most expensive? Which Key Activities are most expensive?</small> KEY COST STRUCTURE <small>Cost Drivers: Structure cost structure, fix price value propositions, maximum automation, selective outsourcing Value Drivers: Focus on value creation, premium value proposition</small> KEY COST STRUCTURE <small>Fixed Costs: Salaries, rents, utilities Variable Costs: Energy Economies of Scale</small> <ul style="list-style-type: none"> Electricity for heat pumps Heating system lease payments to investor Real time operation and optimization of the system 		Revenue Streams <small>For what value are our customers really willing to pay? For what do they currently pay? How are they currently paying? How much does each Revenue Stream contribute to overall revenues?</small> KEY REVENUE <small>Fixed Price Usage Fee Subscription Fee Performance-based Licensing Advertising</small> KEY REVENUE <small>Unit Price Volume Market Penetration Customer Segments Market Expansion Market Development</small> KEY REVENUE <small>Subscription Fee Usage Fee Performance-based Licensing Advertising</small> <ul style="list-style-type: none"> Energy service payments Heat sale payments (feed-in tariff) 		

[illegible]

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039		
Annual new heat capacity, MW																				
Deep geothermal				20			20	40												
Medium deep geothermal	1	1	3	5	5	10	15	20												
Data centers & other incl. excess heat	4	3	2	1	5	5	10	10												
Air-to-water heat pumps				1	3	6	10	15	15											
GSPH & other building integrated		1	3	5	6	10	15	30												
Total, MW	5	5	9	34	22	35	75	115												
Cumulative capacity, MW	5	10	19	53	75	110	185	300												
Investment, M€	4,5	4,2	10,1	58,0	22,5	40,0	102,1	158,5												
Investment (cum), M€	4,5	8,7	18,8	76,9	99,4	139,3	241,4	399,9												
Annual new supported DH, MWh	25 440	25 880	45 797	177 992	111 936	178 080	381 600	516 420												
Supported DH, MWh	25 440	50 840	96 672	269 664	381 600	559 680	941 280	1 326 400	1 526 400	1 500 960	1 475 520	1 429 728	1 256 376	1 144 800	966 720	585 120	0			
Average tariff cost (high), €/MWh	19,5	19,5	19,5	19,5	19,5	19,5	19,5	19,5	19,5	19,5	19,5	19,5	19,5	19,5	19,5	19,5	19,5			18 Years
Feed-in tariff (high), M€/a	0	1	2	5	7	11	18	30	36	29	29	29	28	24	22	19	11	0		6 TWh
Feed-in tariff (high, cum), M€	0	1	3	9	16	27	45	75	105	134	163	192	220	244	267	285	297	297		Average heat price (VAT 0%)
Average tariff cost (base), €/MWh	19,5	18,5	17,5	16,5	15,5	14,5	13,5	12,5	11,5	10,5	9,5	8,5	7,5	6,5	5,5	4,5	3,5	2,5		Cost Increase (145M€/6 TWh*18 years) (1,3/60 €/MWh)
Feed-in tariff (base), M€/a	0	1	2	4	6	8	13	19	18	16	14	13	11	8	6	4	2	0		1,3 €/MWh
Feed-in tariff (base, cum), M€	0	1	3	8	13	22	34	53	71	87	101	114	124	132	139	143	145	145		2,2%

	Fuel cost	Electricity cost	Other cost	Taxes	CO2 cost	Price of heat	€/MWh
Salmisari	5622	6400	613	7302	5926	13063	43,540
	MW						
Electricity capacity	160		Coal	11	€/MWh		
Heat capacity	300		Electricity	40	€/MWh		
Fuel capacity	511		CO2	34	€/tCO2		

Heat production cost, €/MWh	Capex	Opex	Feed-in Tariff
Deep geothermal	34	25	50
Medium deep geothermal	42	31	50
Data centers & other ind. excess heat	8	33	50
Air-to-water heat pumps	17	39	50
GSPH & other building integrated	3	44	50
Electric boiler	2	67	50
Coal-Salmisaari		44	50
Average feed-in tariff			50

[illegible]